V. Operation Desert Fox

V.1 Overview

The tensions over weapons inspections that began in October 1997 continued into 1998. In February, U.N. Secretary-General Kofi Annan worked out an agreement with Iraq that resumed weapons inspections. In turn, Iraq received promises the United Nations will consider removing its economic sanctions. Inspections continued into August, when Iraq cuts ties with weapons inspectors, claiming it has seen no U.N. move toward lifting sanctions. The objectives of Operations Desert Fox were to degrade Iraq's ability to produce and use weapons of mass destruction and to demonstrate the consequences of violating international obligations.

V.2 Timeline

October 31, 1998

Iraq cuts off all work by U.N. monitors. The United States and Great Britain warn of possible military strikes to force compliance. A renewed military build-up in the Persian Gulf begins.

November 5, 1998

The UN Security Council condemns Iraq for violating agreements signed after the end of the 1991 Persian Gulf War.

November 11, 1998

With B-52 bombers in the air and within about 20 minutes of attack, Saddam Hussein agrees to allow U.N. monitors back in. The bombers are recalled before an attack occurs. Weapons inspectors return to Iraq a few days later.

December 8, 1998

Chief U.N. weapons inspector Richard Butler reports that Iraq is still impeding inspections. UN teams begin departing Iraq.

December 16, 1998

A formal UN report accuses Iraq of a repeated pattern of obstructing weapons inspections by not allowing access to records and inspections sites, and by moving equipment records and equipment from one to site another.

December 17, 1998

The United States and Great Britain begin a massive air campaign principally involving our naval forces. The operation involved Navy and Marine Corps strike aircraft from the USS Enterprise and over 200 Tomahawk cruise missiles launched from Navy ships. The attack began at 0100 Thursday. In addition, the USS Carl Vinson, was ordered to speed up its movement from the Indian Ocean into the Persian Gulf. In the morning, 2,000 marines from the amphibious assault ship USS Belleau Wood conduct training exercises close to the Kuwait border. A second round of air strikes begins in the early evening, Iraqi time. The second wave sends cruise missiles

deep into Iraq and Navy strike aircraft with laser-guided bombs targeting Iraqi air defenses along the border.

December 18, 1998

Third night of attacks.

December 19, 1998

Explosions shake central Baghdad. A second US aircraft carrier battle group led by the USS Carl Vinson moves into the Gulf.

December 20, 1998

President Clinton suspends military action against Iraq after a fourth day of air strikes saying the "operation is now complete."

V.3 Event Analysis

An event analysis of the period October 1 through December 31, 1998 was undertaken to determine if a valid statistical relationship existed between naval actions in the Gulf and the major oil, commodity, and share markets. As with the event analysis of the other cases, the main goal of this exercise is to determine whether and to what extent a statistical association exists between naval events and the movements of prices in these markets. If an association exists, is it a positive one of assuring the markets of stability and security, or, in contrast, is the relationship one of increased uncertainty over future oil production and access?

Using the time line for the main events during this period (October 1 through December 31, 1998), the key events are coded (Appendix D) to test these alternative views of naval forward presence and crisis response. In actuality, the two series differ on only two dates, December 17 and 18. EVENTA assumes the naval actions on these days created increased concern over oil availabilities from the Gulf and hence forced oil prices up (the events are assigned a positive number). In contrast EVENTB looks at these events as an indication of US resolve and commitment to preserving stability in the region. It follows that the events are assigned a negative sign in EVENTB.

Using these two sets of event codes as independent variables, a cointegration/error correction analysis was undertaken to determine the manner in which naval actions interacted with key economic markets. This analysis is ideal for the problem at hand because it focuses on the problem of identifying shocks to a system and the manner in which the system adjusts to those shocks. Specifically, the analysis breaks down patterns over time into two components, a short-run impact (event) and a longer run adjustment whereby historical patterns are re-established.

V.3.1 The NYMEX Crude Oil Market

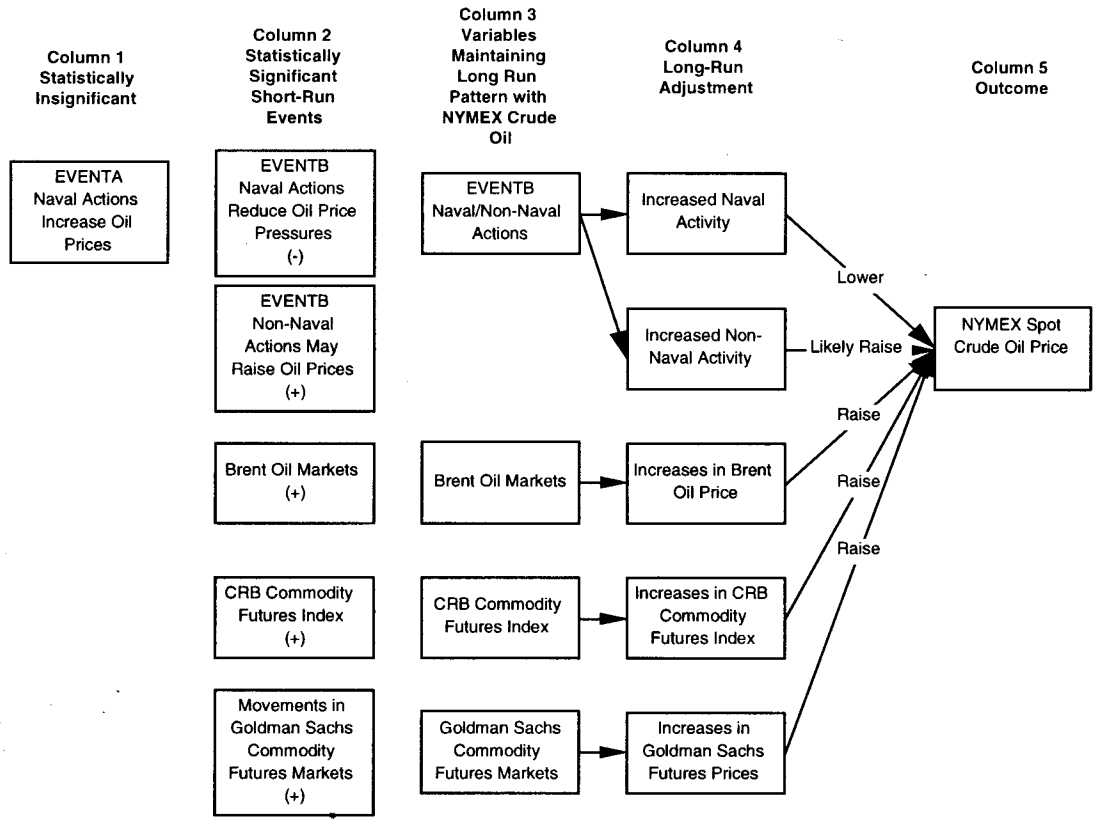
Analysis of the NYMEX crude oil markets suggests that the naval actions during this period stabilized rather than destabilized oil markets. Specifically, EVENTB is statistically significant over a wide variety of alternative specifications, whereas EVENTA is statistically insignificant in all cases.

The analysis also validates the applicability of the cointegration/error-correction mechanism in this market. That is, the NYMEX market is characterized by being affected by a

series of short-run shocks (events). Following these shocks, a longer-run period of adjustment restores the NYMEX's historical relationship with other commodity/energy markets. The main findings are outlined in Figure 13.

Figure 13

Operation Desert Fox: Event Analysis of the NYMEX Crude Oil Market



Note: Graphical depiction of the results from the ARDL/error correction analysis. In the short-run naval actions reduce oil price pressures, whereas non-naval actions increase prices in these markets. The same applies to movements in the Brent oil markets, the CRB commodity futures index and the Goldman Sachs Commodity Futures Markets. Naval/non-naval events along with these three markets also form a long-run pattern with the NYMEX with naval actions the only variable lowering oil prices over this time interval.

Given their negative sign in the EVENTB variable and that variable's positive sign in the NYMEX regression equation, it is apparent that naval actions lower the spot oil price. In contrast, other events such as Iraqi belligerence, etc., would tend to raise the price of oil. Since the

NYMEX establishes a long–run pattern with several commodity markets, the CRB and the Goldman-Sachs, increases in their price is also reflected in movements in the NYMEX.

Because the NYMEX maintains a long-run pattern with other commodity markets, naval events also play a role in re-establishing these relationships through influencing the pattern of long-run adjustment. An error correction process through which oil market equilibrium is restored depicts this adjustment mechanism. In the case at hand, a typical pattern is one whereby the error correction term (ecm) has a negative sign in the NYMEX equation. This means that increases in the ecm reduce price pressures in the NYMEX market.

A typical pattern in the ecm equation is one in which a variable such as the Brent oil price has a negative sign. Increases in the Brent oil price therefore set off a process of adjustment in the NYMEX market to restore the long-run pattern between the two markets. Because the BRENT variable has a negative sign it reduces the size of the ecm term. This in turn, because of it's negative sign in the NYMEX equation, results in upward pressure on the NYMEX, thus aiding in reestablishing the long-run patterns between the two markets.

The EVENTB variable also has a negative sign, suggesting that as with the BRENT, increased values would tend over time to result in increased NYMEX oil prices. This is clearly true for the non-naval events. However, since naval events have a negative sign in this variable, the reverse occurs. That is, everything else equal, naval events during this period actually resulted in lower prices over time as a mechanism of restoring equilibrium in the NYMEX market.

V.3.2 The S&P-100 Index

Share prices are quite volatile and are said to reflect the market's assessment of key events' impact on future profitability and the like. In general the markets prefer certainty and, more often than not, increase in value during periods of relative stability. As is well known, the share markets are averse to uncertainty, often going into prolonged declines until whatever they are leery of is resolved. One often hears that US naval actions, particularly ones similar to those examined in this case, create, in the net, more doubts and uncertainty over future economic conditions and hence depress the share markets. In actuality, the event analysis suggests that quite the reverse is the case.

Event analysis again identified the existence of a number of long-run patterns that are re-established following a destabilizing event. In the case of the S&P-100, long-run patterns at this time existed with the New York Stock Exchange Composite index (NYSE) and the dollar index. See Figure 14. Increases in the NYSE and the dollar index set off a long-run-adjustment in the S&P raising its value commensurate with the other two. EVENTB has a negative relationship (negative sign in the S&P value equation). Everything else equal, an increased level of events should depress the S&P. This is true for most events. However, naval events in EVENTB have a negative sign so their presence actually results in an increase in share prices.

EVENTB has a positive sign in the ecm or long-run correction effect following a shock. Given the negative sign of the ecm in the S&P share price equation, it appears that most events would again tend to reduce the value in this market. Again however, because naval events have a negative sign in the EVENTB term, their presence actually results in increased share prices during the long-run adjustment process.

V.3.3 The CRB and Goldman Sachs Commodity Indexes

These two key commodity indexes were also affected by developments during this period in the Gulf. See Figures 15 and 16. The mechanisms are quite similar to those associated with the NYMEX market described above. Both markets reacted negatively (increased price due to perceived risk) to non-naval events in the Gulf. As with the NYMEX, both markets interpreted naval events as providing increased security and certainty of supplies. This was true not only in terms of the short-run impact of naval events, but through their affecting lower prices over time during the period of longer-run recovery from events in the region.

V.3.4 Implications

The important finding here is that while naval events have an apparent short-run stabilizing effect on key markets, they also set off a long-run adjustment process (at least in the markets examined here) that is subtle, but more significant in terms of total magnitude. In large part, the subtle nature of these long-run effects explains why they have not been previously detected and have thus received little or no attention in the debates over the economic consequences of naval forward presence.

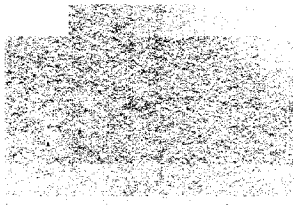
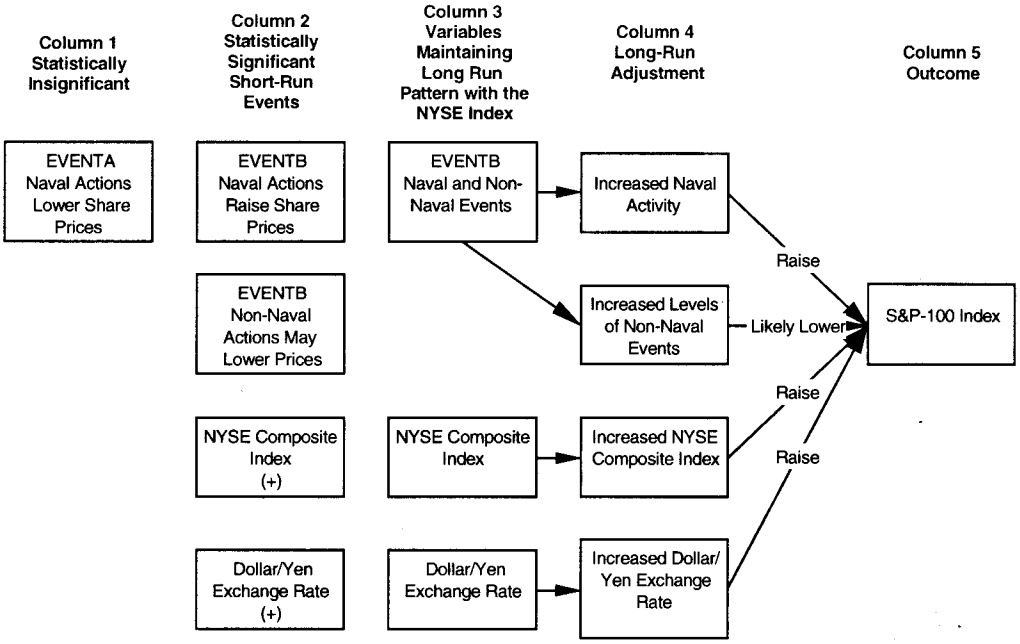


Figure 14

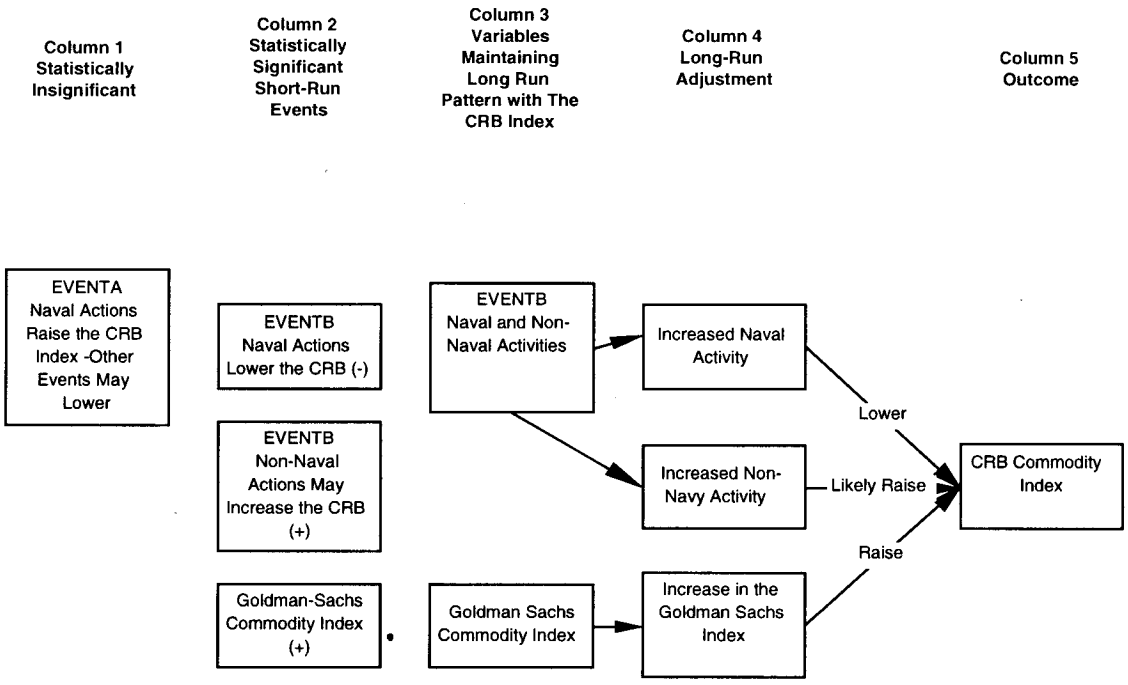
Operation Desert Fox: Event Analysis of the S&P-100 Index



Note: Based on results from the ARDL/error correction analysis. See Figure 13 for a description of the main linkages and their interpretation.

Figure 15

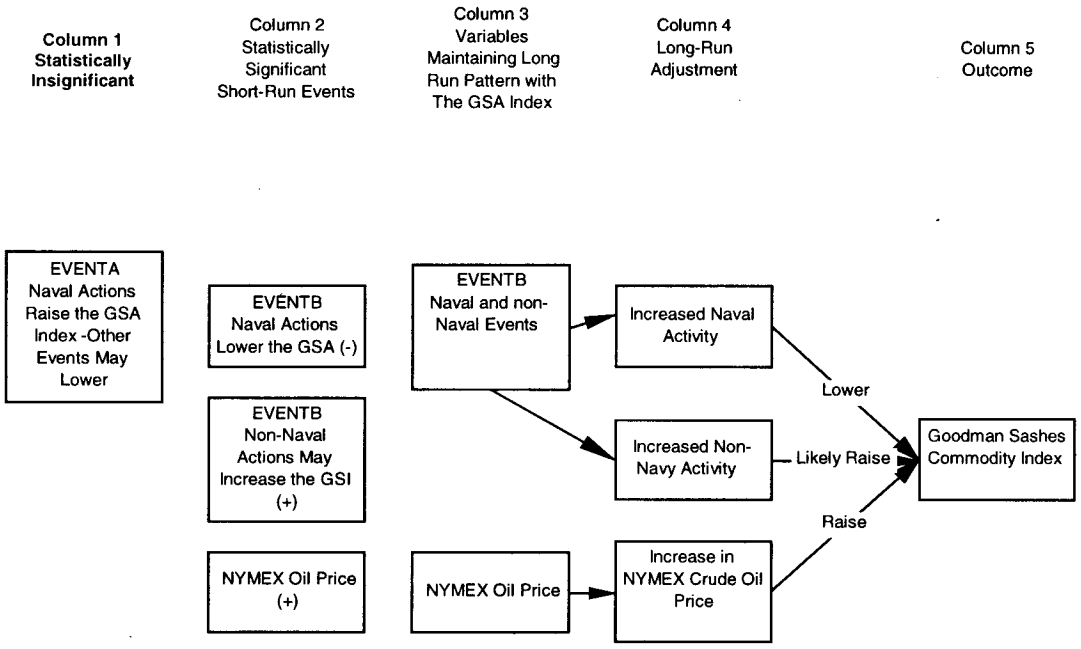
Operation Desert Fox: Event Analysis of the CRB Commodity Index



Note: Based on results from the ARDL/error correction analysis. See Figure 13 for a description of the main linkages and their interpretation.

Figure 16

Operation Desert Fox: Event Analysis of the Goldman-Sachs Commodity Index



Note: Based on results from the ARDL/error correction analysis. See Figure 13 for a description of the main linkages and their interpretation.

V.4 Oil Market Developments

The Financial Times accounts of this period (Paul Solman, "Oil Prices Slipped Yesterday in Spite of Continued Military Action in the Gulf," Financial Times, December 18, 1998, p. 34; Robert Corzine, "Slide in Crude Surprises All," Financial Times, December 24, 1998, p. 20) suggest that the outlook for a sustained price increase was uncertain at best. According to that source, the factors that triggered and exacerbated the price declines in 1997 - a collapse in Asian demand due to the regional financial crisis, rising Iraqi exports, an uncertain global economic

outlook, a surplus of crude oil and refined products and erratic compliance by members of the Organization of Petroleum Exporting Countries to promised production cuts – had not yet dissipated.

The view among oil companies was generally bearish (Paul Solman, "Oil Prices Continue to Drift Downward," Financial Times, December 11, 1998, p. 30; Paul Solman, "Outlook for Oil Remains Uncertain," Financial Times, January 2, 1999, p. 8; Robert Corzine, "Prospects for Firmer Prices Uncertain," Financial Times, January 29, 1999, p. 3). Most appeared resigned to a prolonged period of low crude prices, with some even arguing that the present downturn might be much more than merely the rock bottom of the commodity cycle. Many thought that the global industry might be facing a fundamental restructuring and realignment, with low-cost producers, especially those in the Middle East, likely to reassert their dominance in coming years at the expense of higher cost areas, such as onshore North America and the North Sea.

V.5 Economic Benefits

Key Dates

December 8, 1998

Chief UN weapons inspector Richard Butler reports that Iraq is still impeding inspections. UN teams begin departing Iraq. Prior to this date the oil markets had been relatively calm with only minor changes in the NYMEX over the period December 2 through the 8th. Also, on December 8 the spot was just slightly below the first forward contract indicating the markets had little concern over supply availabilities. This is evidenced by the general pattern of forward rates gradually sloping upward during this period. There was never an extremely high premium for earlier rather than later delivery (downward sloping forward profiles) as had characterized the period right after the invasion of Kuwait (Desert Storm).

December 9, 1998

Starting on the 9th however, the spot started trading at a considerable premium vis-a-vis the first forward contract. See Figure 17. It is therefore fairly safe to say that the markets were in short-run equilibrium on the 8th , only to become somewhat alarmed by deteriorating conditions after that date.

December 16, 1998

A formal UN report accuses Iraq of a repeated pattern of obstructing weapons inspections. As the chart below indicates, however, the spot market was considerably below the first forward suggesting little concern over availability of deliveries. This is also borne out by the generally negative values for the first-second forward contracts during the period.

December 17, 1998

The United States and Great Britain begin a massive air campaign principally involving naval forces. Oil markets react with a sharp increase in the spot rate.

December 20, 1998

President Clinton suspends military action against Iraq after a fourth day of air strikes, saying the "operation is now complete." The markets appear to have equilibrated quickly on the first subsequent day of trading (Monday, December 21, 1998).

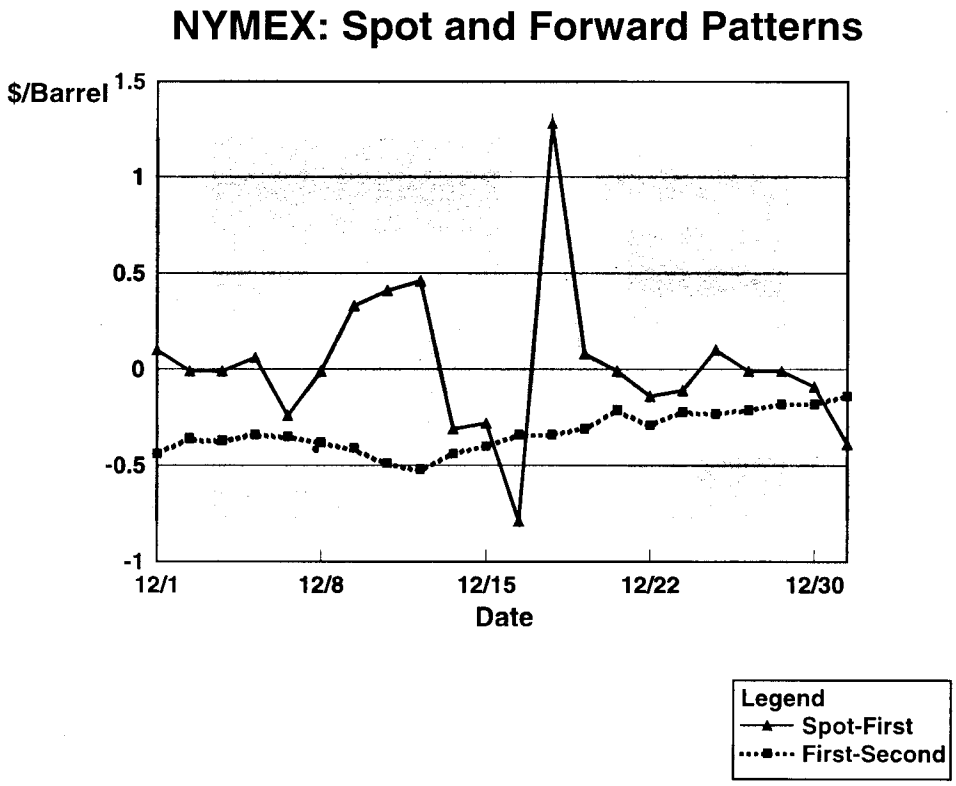
V.5.1 Assumptions

These developments and movements in the oil markets suggest two possible sets of dates for calculating economic benefits associated with naval forward presence/crisis response:

- The first set (Measure A) covers the period December 8 through the 21—from the first sign of a crisis to the time the crisis was resolved through naval action. The fact that oil markets were tranquil at the time suggests that this measure may be a slight underestimate of the benefits derived from naval action.

- The second set (Measure B) covers the period December 16 through the 21—from the first sign that actual fighting might erupt to the time the crisis was resolved through naval action. Given some of the elevated price at this date was no doubt caused by the anticipation of a conflict, this measure overstates the economic benefits derived from naval action.

Figure 17



Using these intervals, a VAR forecasting model of the US economy was constructed. Statistical tests indicated that both the NYMEX spot market and the dollar/yen exchange rate

were significant in affecting the manner in which the crisis impacted US GDP. In the estimates below (Table 4), the oil impact was calculated first and a second set of calculations undertaken to see how movements in the dollar/yen rate by itself might have impacted on the economy. A final set of calculations combines the oil price movements with that of the dollar/yen rate. The result of this combination is not a simple additive amount as each may have negated the other during certain quarters. The final estimate does however provide a rough range of benefits associated with naval action during the period.

V.5.2 Findings

While the findings in Table 4 show benefits that are most likely in the range of three billion 1995 dollars (Table 4, Model III), there are some biases built into the analysis. For one thing, given data limitations, the impact of the operation can only be measured through 1999 thus no doubt biasing the results downward somewhat.

The second problem is that one gets a somewhat different picture if just the oil price effect (NYMEX) is used versus using both the NYMEX and the dollar/yen exchange rate. The VAR Model analysis suggests that both variables should be used in the economic benefit calculations. However, no direct statistical link was found between events and the dollar/yen exchange rate while a strong one existed with the NYMEX. If one accepts the event analysis finding and leaves the dollar/yen rate out of the VAR then the benefits lie between 1.1 and 3.6 billion 1995 dollars, Table 4, Model I. A conservative estimate therefore places the benefits at between 1.1 and 3.6 billion (1995) dollars.

V.6 Conclusions

As with the Taiwan Strait case, the analysis has found strong stabilizing effects between naval actions and a number of key markets. There is a striking similarity to the two sets of results in that key naval actions provide a stimulus to share markets while retarding the upward movement in oil and commodity prices. As with the Taiwan strait case one can only interpret the results as suggesting that the markets look at naval forward presence and crisis response as a stabilizing force, providing security of supply and continued access to supplies. They are not viewed as ushering in a period of protracted instability and uncertainty.

Table 4

Operation Desert Fox:
Naval Crisis Response Impact on the United States Economy

(Billions 1995 Dollars)

	Measure A	Measure B
Model I – Oil Price Effect		
Date		
1999Q1	0.1	0.5
1999Q2	0.2	0.7
1999Q3	0.3	1
1999Q4	0.5	1.4
Impact Through 1999	1.1	3.6
Model II – Yen Effect		
Observation		
1999Q1	0.5	0
1999Q2	0.8	0.1
1999Q3	1	0.1
1999Q4	1.2	0.1
Impact Through 1999	3.5	0.3
Model III – Combined Oil/Yen Effect		
Observation		
1999Q1	0.5	0.4
1999Q2	0.7	0.6
1999Q3	0.9	0.9
1999Q4	1.1	1.2
Impact Through 1999	3.2	3.1

Notes: The statistical output of the ARDL/error correction analyses and VAR models on which these results are based are contained in a separate set of appendices available from the authors.

Order of VAR = 2.

Model I – Oil price effect examines just the impact of oil price changes on US GDP; Model II – Yen effect assess the impact on US GDP due exclusively to movements in the Japanese Yen; and Model III – Combined oil/yen effect examines the simultaneous impact of oil price and yen changes on US GDP.

Impact Measure A is derived by subtracting the US GDP estimated on the assumption of December 8 oil and dollar/yen forward prices from that estimated on the basis of December 21 prices.

Impact Measure B is derived by subtracting the US GDP estimated on the assumption of December 16 oil and dollar/yen forward prices from that estimated on the basis of December 21 prices.